# AGRICULTURAL NEWS LETTER

VOL. 9 - NO. 4 JULY-AUGUST, 1941

This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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# AGRICULTURAL NEWS LETTER

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## "VISIBLE" PACKAGING OF FRUIT AND VEGETABLES.

EDITOR'S NOTE: An increasing number of progressive fruit and vegetable growers are following with interest the changes taking place in the retail selling of produce. The following covers research work with "visible" packaging, one of the most important improvements in produce merchandising, and one which is attracting much attention in retail marketing circles.

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The tremendous increase in self-service markets has changed the shopping methods of countless women. The effects this has had on the distribution, display, and packaging of foodstuffs are far-reaching. One bottleneck which prevents complete self-service in any food store is the produce department. This department, however, is one of the most important to the store, being counted on to do approximately 25 per cent of the store's total sales (not including meats). Clerks are needed to wait on customers at the produce department and, during rush hours especially, customers often wait several minutes to make purchases.

This bottleneck is accentuated even more by the fact that the Defense Program is taking more and more store clerks into the armed services and to more highly paid jobs in defense industries. New help, even when available, is untrained and slow. Consequently chain-store executives are giving more attention to methods of self-service for produce, and to cutting down store waste and shrinkage. Much of this investigation is to see to what extent packaging of fruit and vegetable items will solve the problem.

Women like to see the produce they buy, to determine quality, color, freshness, and cleanliness. Therefore, the type packages which have received the most attention and have been most successful are the so-called "visible" packages. "Visible" packages of the proper consumer size, well displayed in a special department, ready for quick pick-up and (insofar as possible) prepared for immediate use without further cleaning and trimming, appeal to present-day shoppers. In addition, store waste and shrinkage are largely eliminated, store traffic is speeded up, and the produce department "bottleneck" is relieved.

The Du Pont "Cellophane" Division is cooperating actively in this packaging research along several lines: (1) with the grower packing in the field; (2) with the large city repacker or wholesaler; (3) with the chain-store central packaging in their own warehouse for local distribution; and (4) with the small retailer packaging in his own store to make the most efficient use of his clerks' time during slack hours.

Results have shown considerable promise. Previous articles in the "Agricultural News Letter" have described "Cellophane" packaging of fresh corn, celery, potatoes and cucumbers by the grower. Square sheets of "Cellophane" cellulose film placed over the tops of berry baskets and held in place by means of rubber bands

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or gummed tape are used by growers of all types of berries as well as of brussel sprouts. Tomatoes are packed in "Cellophane" window boxes or in boats and trays and machine-overwrapped with "Cellophane" by the grower or tomato repacker.

Many produce wholesalers and repackers have added a side-line to their business recently; namely, the packaging of cut-up, assorted vegetables for soup mix or fresh salad bowls, as well as cole slaw, and trimmed, washed, ready-to-cook spinach in bags of "Cellophane". These operations are proving profitable, when properly handled and merchandised, and rapid expansion is taking place.

Experiments are being conducted on central warehouse and store packaging of innumerable fruit and vegetable items to make them self-service in the retail store. Items being experimented with are those which the store or chain cannot obtain in consumer-size, "visible" packages at present. Most retailers and chains prefer to handle packaged produce. They can obtain better retail prices for top quality, save time, waste and store shrinkage, and therefore pay more for such produce. Growers serving local outlets can package many more items in "Cellophane" than they are now doing, and build up increased profit. Research is continually going on to develop better packages and shipping containers for those farther from their retail outlets.

As stated previously, most stores are anxious to obtain visibly packaged produce. The attached photograph shows how they departmentalize such goods, making them easily available for self-service - set apart slightly from the regular produce department. The small display illustrated shows gross sales from $125.00 to $150.00 per week, and is rapidly increasing as new items are being added. The reaction from consumers has been especially gratifying, and most of them express a preference for buying in this manner.

As this self-service packaging of fruits and vegetables progresses, it is of interest to every progressive grower to cooperate as fully as possible with retailers and other distributors to work out various details to make the plan more successful. We intend to present other "Cellophane" packages through the "Agricultural News Letter" as rapidly as our research develops them to a practical point, and will be glad to cooperate in any experiments now under way or planned.


HEARTS
2 PKG. 29¢
Washed Spinach
Salad Mix
Cole Slaw
2 PKGS For 19¢
Fancy CUKES
2 For 25¢
Cauliflower
15¢
Washed Spinach
2 PKGS 19¢
Salad Mix
2 For 19¢
Celery Hearts
2 For 29¢
Fresh Shelled Peas
29¢ Box
Cole Slaw
2 For 19¢
D541-16131

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# MILK PRODUCTION WITH UREA AS A SUBSTITUTE FOR LINSEED OIL MEAL.

EDITOR'S NOTE: Experiments have been conducted at the University of Wisconsin Agricultural Experiment Station since 1936 to determine whether cattle can utilize urea for part of their requirements of protein nitrogen. The Sept.-Oct. 1940 issue of "Agricultural News Letter" carried a progress report of the results. The following gives additional data obtained from 24 cows which were continued on the experiment. Reprints of this and previous papers will be sent upon request. It should be pointed out that defense needs for nitrogen are so heavy that present supplies of urea for commercial and industrial purposes are strictly limited, making it impossible at the moment to supply urea for feed for ruminants.

By I. W. Rupel, G. Bohstedt, and E. B. Hart,
Agricultural Experiment Station,
University of Wisconsin,
Madison, Wisconsin.

The 24 cows have been continued on the experiment to determine the efficiency of urea for milk production. The plan as previously reported was to feed a basal ration of corn silage, timothy hay, and a grain mixture of yellow corn and oats fortified with iodized salt and bone meal. The grain concentrate contains about 10 per cent of total protein. This is recognized as too low for sustained milk production. To this ration was added urea sufficient to make the protein equivalent of the grain mixture 18 per cent. Linseed oil meal was used as the protein concentrate and added to the grain mixture in a quantity sufficient to raise the protein level to 18 per cent. Each cow is expected to pass through three lactations on the above ration; that is, basal - basal + urea - basal + oil meal. This report can deal only with the records of those animals that have finished the first and second lactations.

In addition to the above plan involving six cows in each group there was also a group receiving the basal ration + urea + corn molasses. This last experiment was carried out under the supposition that possibly better urea utilization could be secured when there was ingested some soluble sugar that would favor maximum bacterial synthesis in the rumen.

Since these cows were received in the spring of 1939 and after they had freshened - the period varying from 6 to 13 weeks - it was necessary to make the milk production comparisons at the same period in the second lactation. The records of milk production are given in the accompanying charts and are self-explanatory. These records are all reduced to a 4 per cent fat level.

1. From the records displayed it is clear that the addition of urea (3 pounds in the grain mixture) to the basal ration definitely increased milk production.

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In two cases, number 4 and 5, this amounted to 1,500 to 2,000 pounds of milk in 35 weeks. Also there was a definite drop in milk production after the animal was changed from the oil meal ration to the basal ration. These statements are made for the definite purpose of showing that the basal ration was inadequate in nitrogen for the fullest milk production.

2. In comparing oil meal with urea on the same nitrogen basis, it can be seen that the results are mixed with no definite superiority of one over the other. In the five records of 2 lactations completed to date 2 cows, number 7 and 10, gave more milk on the urea ration than on the oil meal. Two cows, 11 and 12, gave more milk on the oil meal than on the urea ration, and number 8 gave practically the same volume on either ration.

3. In respect to the advantage of feeding a soluble carbohydrate when urea is used, the results again are mixed. Three of the animals produced more milk when corn molasses was used with the urea, while two of the animals did not show any improvement in milk production by its use. As a matter of fact, data secured with a heifer having a rumen fistula, and in which the relation of carbohydrate in urea utilization is being studied, definitely show that a carbohydrate-like starch will function quite as well as a molasses in increasing bacterial action and utilization of urea. In other words, the feeding of grains, with their natural starch content, will always insure a rapid and effective utilization of the urea ingested. The problem of urea utilization when only a roughage such as hay and silage is being fed without grain or any other carbohydrate is being studied.

4. Questions will always be raised by dairymen contemplating the use of some new substance in feeding operations.

(a) Does it disturb the breeding potency of the cow?
(b) What is the effect on the size of the calf?
(c) Does the cow maintain its weight and appearance?
(d) Does the cow breed and act better on the oil meal as compared with urea?

In answering these questions it should be remembered that we have completed only two lactations and a third is planned before assay of all the data can be made and a more complete answer given to the questions raised. Nevertheless the indications are quite definite that there is no more trouble in settling with calf those cows receiving urea than those that receive oil meal. Why should there be? At the rate urea is fed it is all converted to bacterial proteins in the rumen and these bacterial cells have always been the habitants of the rumen of cows - but only when urea is fed are more favorable conditions established for maximum production of bacterial growth and bacterial proteins. In other words, a favorable medium of urea, carbohydrates, salts, reaction, and temperature has only served to multiply the bacterial cells with their protein accumulation. All the cows receiving urea have been settled for the second and third calf with no more delay than when oil meal was used. The size of the calves produced on urea has varied in one urea group of 6 from 93 to 115 pounds and in another group of 6 receiving urea from 77 to 101 pounds. On oil meal the birth weights of the calves varied from 79 to 104 pounds. On the basal ration they varied

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from 91 to 106 pounds. These are the data for the first lactation. In the second lactation the birth weights of the calves on urea varied from 95 to 112 pounds and on urea plus molasses from 93 to 105 pounds. On the oil meal they varied from 101 to 106 pounds and on the basal from 96 to 105 pounds. These results would not indicate that there had been any impairment whatever in fetal development by the use of urea. The data fully support the view that urea feeding has in no way interfered with reproduction.

In respect to the maintenance of weight and appearance after calving, with its accompanying reduction in weight; the weight regained has been normal and as rapid on urea feeding as on oil meal feeding. These animals were always fed according to their milk production, namely, one pound of concentrate per 3-1/2 pounds of milk. As judged by expert animal husbandrymen, those cows receiving urea could not be distinguished from those receiving oil meal. Smoothness and glossiness of coat was no more a characteristic of oil meal fed animals than those receiving urea. The data so far secured with urea appear to make it a safe and effective substitute for oil meal when fed at 3 per cent of the dry matter of the concentrate or approximately 1 per cent of the dry matter of the entire ration. Our earlier results with growing calves indicated some damage to the kidneys when the urea content was much above 2 per cent of the dry matter of the entire ration.

## Chart 1

An Experiment on the Use of Urea as a Substitute for Protein

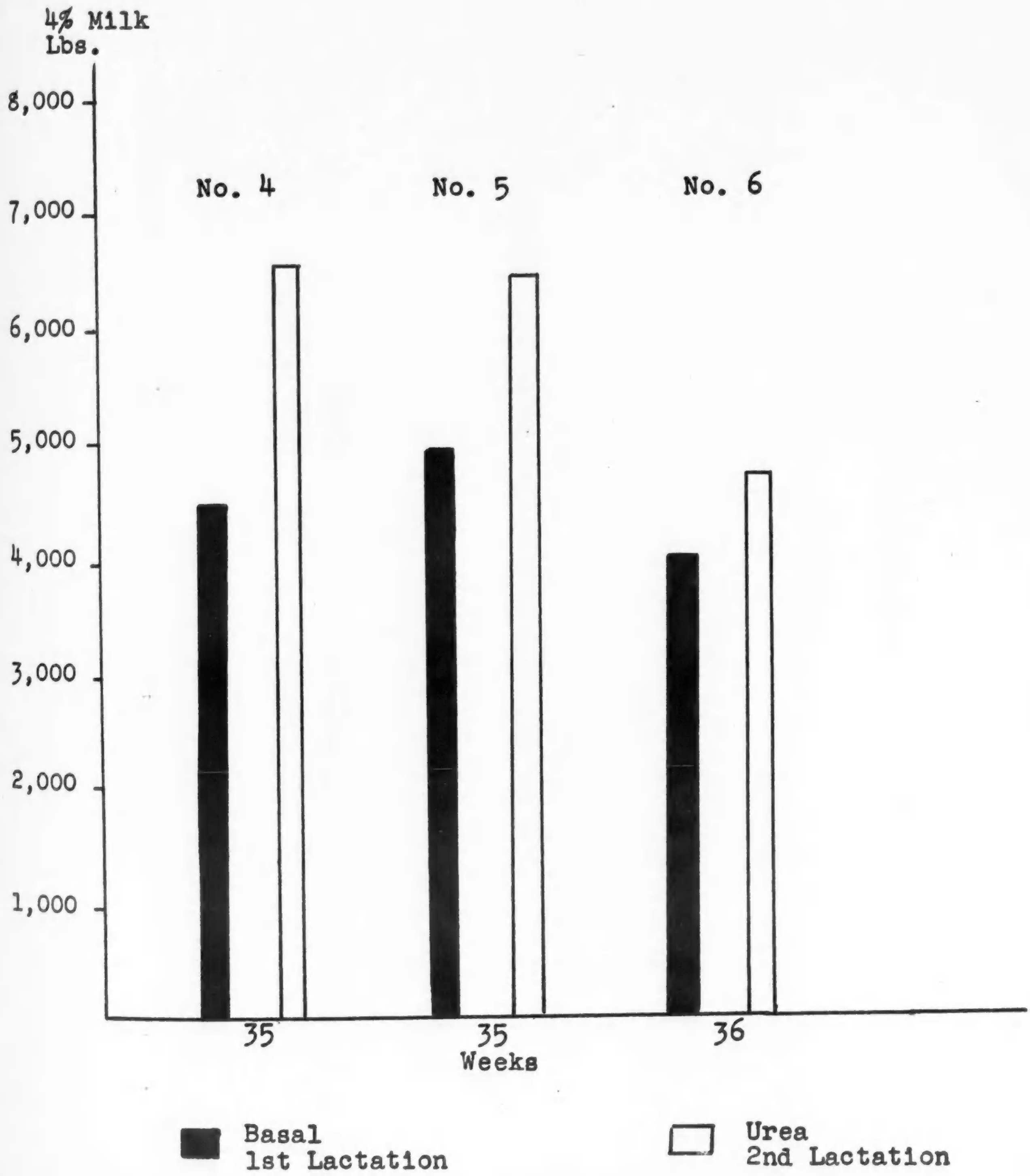
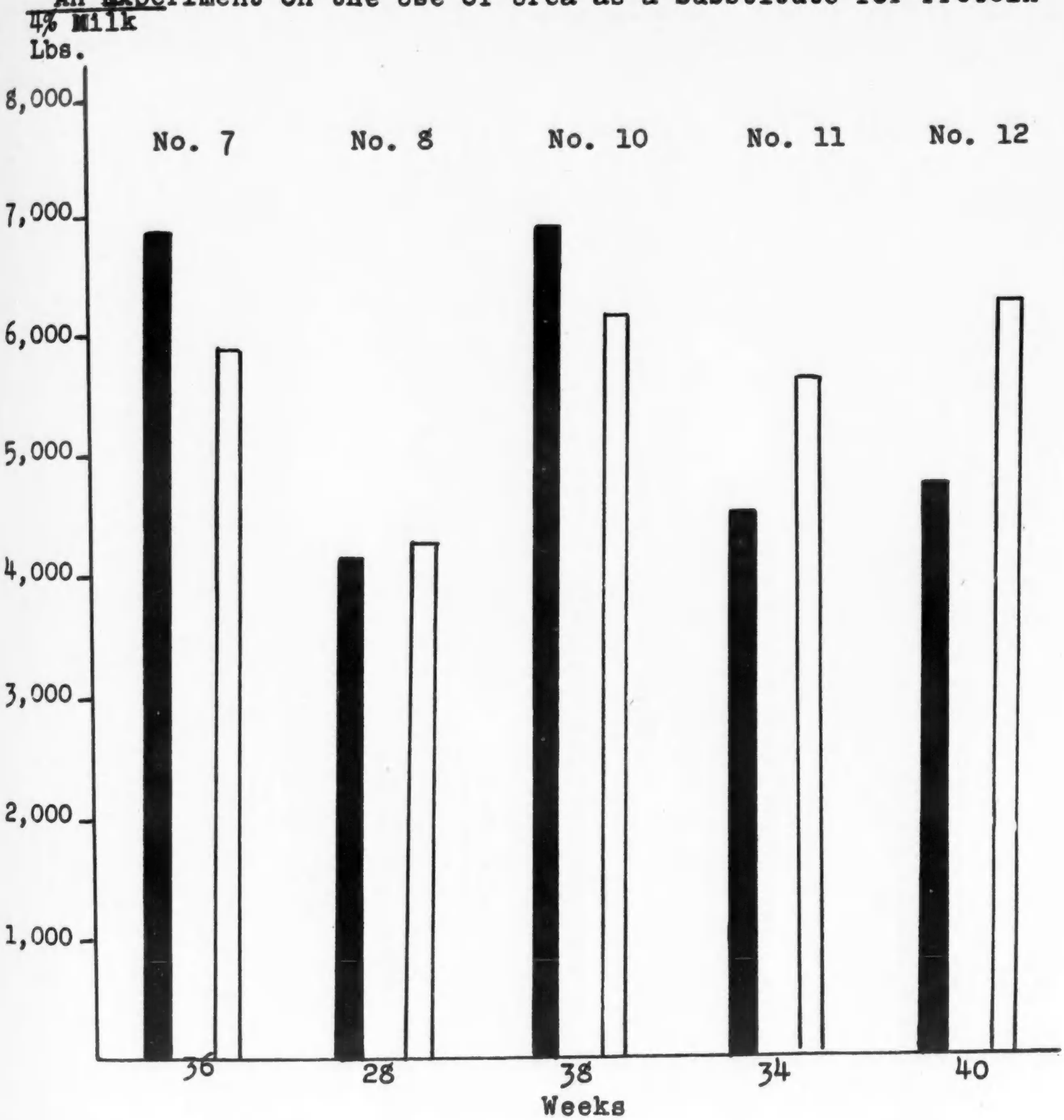


Chart 2

An Experiment on the Use of Urea as a Substitute for Protein



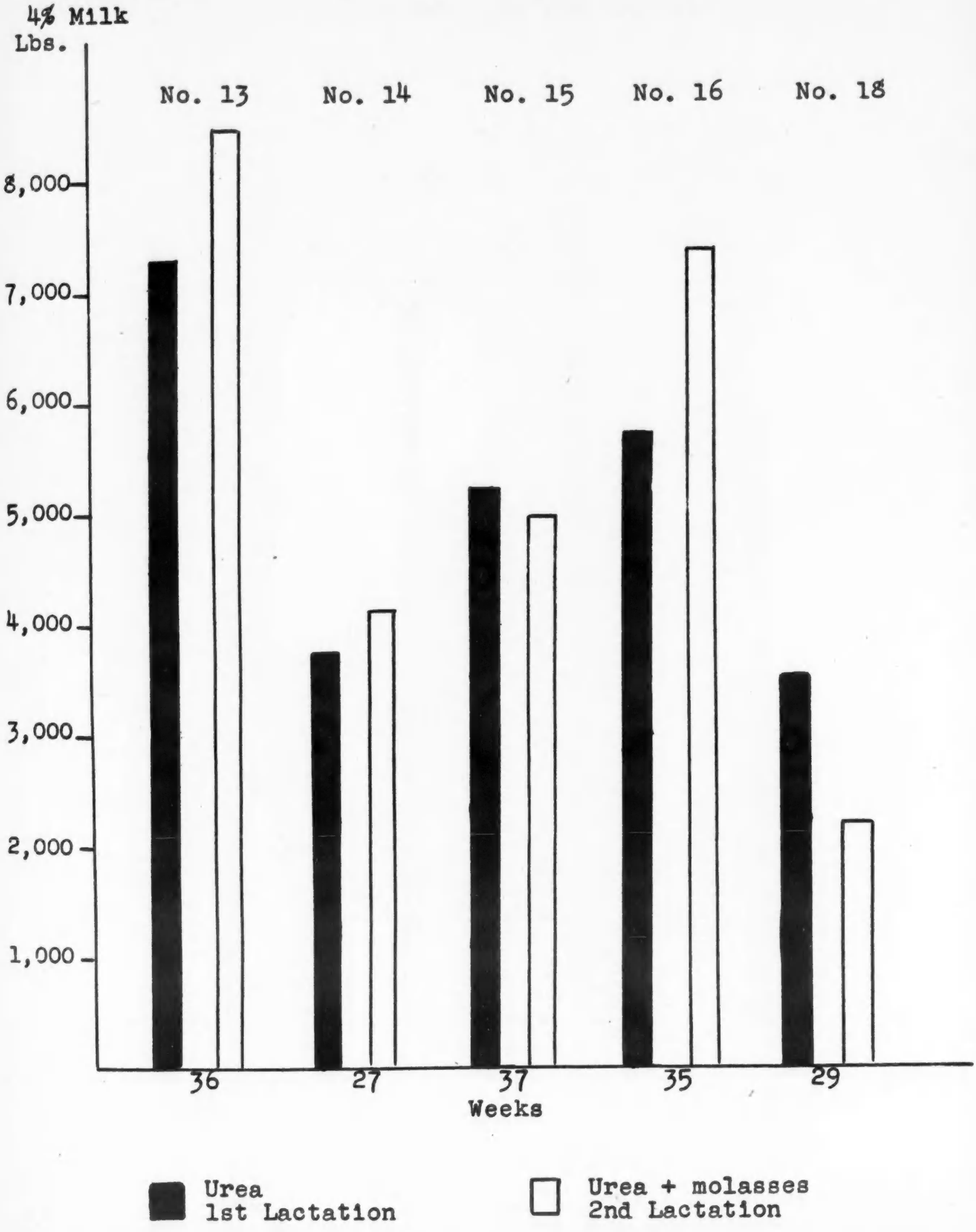

Same protein equivalent level

Urea
1st Lactation

Oil meal
2nd Lactation

## Chart 3

An Experiment on the Use of Urea as a Substitute for Protein



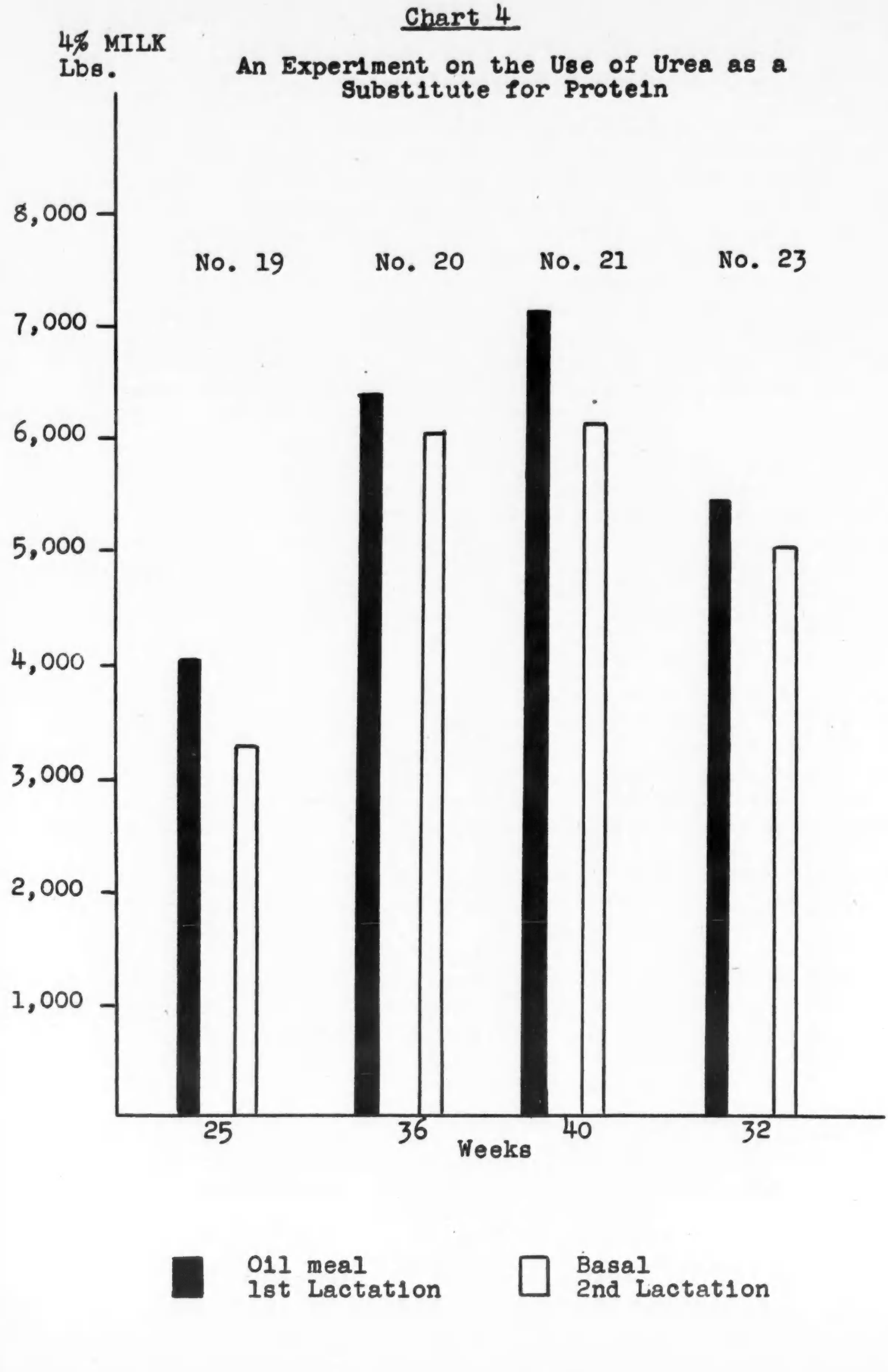


Chart 4
4% MILK
Lbs.
An Experiment on the Use of Urea as a Substitute for Protein
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
No. 19
No. 20
No. 21
No. 23
25
36
40
32
Weeks
Oil meal
1st Lactation
Basal
2nd Lactation

## THE QUESTION MARK ELIMINATED FROM COLOR SELECTION

EDITOR'S NOTE: Have you ever said to yourself as you tried to select a new paint color for your home, "That's a pretty color. But how will it look on my walls?" The Du Pont Color Selector gives you the answer. It's based on years of research into methods of helping home owners to visualize how paint colors will look when actually applied. It helps eliminate the discouraging results often obtained when inexperienced individuals attempt to do their own experimenting in the choice of colors of their paints. The book, described below, is not available for free distribution. It is, however, available for study at all Du Pont Paint Stores, and is in the hands of many painting contractors.

For years, home owners, painters, decorators and architects have had to choose colors from little chips on color cards. And because these same colors look so different when applied to a large area, the results have often been disappointing. Some painters, to overcome this difficulty, mixed various samples and painted them on the surface to be finished. This made selection easier, but was a costly, time-consuming process. The new Du Pont Color Selector Book follows this principle, but applies it more practically, without the expense and delay of experimental matching.

The choice of appropriate shades is simplified by providing large sheets of solid color and natural color photographs printed on a film of transparent cellulose acetate. Pictures of completely furnished rooms have transparent wall areas and when placed over a color sheet, the room is visualized as painted in that color. Other transparent pictures portray various houses arranged to show the body painted in a selected color and shutters done in trim color.

A loose-leaf arrangement allows the color sheets to be withdrawn for matching against draperies or furnishings, supplementing the tiny color samples or "chips" offered on paint cards.

The twelve interior transparencies—living rooms, dining rooms, bedrooms, kitchens and bathrooms—in combination with 100 color sheets, create a total of 1200 different interior suggestions. The exterior designs are shown in correlation with 340 various combinations. A special shutter transparency, placed over a trim color sheet, depicts shutters of various shades against white or yellow siding.

The four exterior transparencies illustrate American Colonial, English, Cape Cod Cottage, and Mediterranean styles. The exterior color sheets include white, yellows, buffs, grays and tans, a series of cement and stucco colors and a group of 17 trim finishes.

An explanation of paint styling's role in decoration is included in the new Du Pont book. The effect of color on size, contrast with surroundings, roof colors, and methods of painting dormers and gables is demonstrated, and colors to enlarge or diminish their appearance are noted. Suggestions also are given on color and tint correlations.

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## A PLEA FOR RESEARCH

EDITOR'S NOTE: Former President Herbert Hoover delivered an address at the Commencement Exercises of Haverford College on June 7, 1941, which is of vital interest to all those engaged in scientific research. A resume of that address is printed below.

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Expansion of research facilities in pure and applied science to increase efficiency and productivity and to alleviate the hardships of our American people both during and after this war is urged by Herbert Hoover.

"Unless we quickly have more...discovery and invention and a more efficient application of what we already know our standard of living and even our civilization will degenerate," Mr. Hoover warns.

Scientific research is needed, first, to increase production of consumer goods so it will parallel armament production and our living standard will not drop, he says. It is needed, second, to develop a defense for airplane warfare, and, third, to increase the technological power of an America which will be greatly impoverished and smothered with debt after the war.

He points to chemurgy as one of the many fields in which "we sorely need support for research in the application of pure science discoveries we already know."

"One of the greatest of our problems right now," says Mr. Hoover, "is to develop more industrial raw materials which our farmers can produce in substitution for their overproduction of food. I doubt whether we are spending five millions a year looking for them. And we are compelled to subsidize the farmer with a billion a year and to regiment him besides until we find some such solution as this.

"And in the realm of industry there are vast possibilities in synthetic fibers, rubber, in the plastics, or new sources and methods of making and use of cellulose and a score of other things. There is the field of metallurgical treatment of low-grade ores. If we developed such methods we could free ourselves from depending upon imports of chrome and manganese. We need substitutes for materials needed for defense. I doubt that actually three millions a year are being spent in such research laboratories."

Pure scientific research is decreasing in the universities, and their total resources for pure science do not approximate $20,000,000 a year. "That is not equal to our cosmetics allowance by a good deal," he states.

"Never in the whole history of fundamental science have there been so many vistas opened before us as right now," he says. "Discovery and invention expand in geometrical progression. Inventive minds play upon every new invention and breed a dozen more.

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"I believe every physical scientist in this country today could name new paths, new fields, that await for the money to mobilize men and equipment. Many of their results may be sterile but somewhere something comes - an improved instrument, a new path opens and in the end an increase in the standard of living.

"Some will say that great discoveries of fundamental law cannot be forced - that we must wait for them. I do not contend you can go out and buy such a genius and have him produce every morning. But I do say he cannot perform without equipment and support.

"We will spend 20 billion a year on armament," Mr. Hoover continues. "We will pile most of it up in national debt. If we would invest one per cent of this in an insurance policy called research and elimination of waste, we might save some of the bankruptcy when these wars die.

"It is possible that the aggressive superiority of the airplane in war may be checked. And that becomes vital to the freedom of nations and to stop the massacre of women and children. "And it is not beyond human imagination that the quiet, unobtrusive scientist and engineer in their laboratories might make all nations self-contained in raw materials and their production of goods. And what a holocaust that would be for international quarrels and international thinking - and for much of the causes of war."

Denying that frontiers are a thing of the past, Mr. Hoover declares that "adventure and opportunity beckon in every avenue of science. They beckon from the great profession of men trained to research. They beckon from its thousands of applications. From it spring tens of thousands of new services and industries.

"In them human courage, character, and ability have an outlet that never came even with the two-gun frontiers. Just as the new villages followed the stockades of the frontier, so do new cities follow every new mastery of technology and power.

"But research can bring far more than defense from aggression, or the opening of new frontiers, discoveries, adventures, inventions, labor-saving devices, more power or increased standards of living," Mr. Hoover concludes.

"There also lies in these fields a contribution to the moral and spiritual welfare of mankind. Here is the lifting of men's minds beyond the depressing incidents of the day. Here lies the unfolding of beauty, the ever-widening of the boundaries of knowledge. Here is the 'inculcation of veracity of thought' in a world sodden with intellectual dishonesty. Here is the harmonizing of the individual to the pattern of his environment. Here is the confirmation of a Supreme Guidance in the universe far above man himself."

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## METHYL BROMIDE - - A FUMIGANT

EDITOR'S NOTE: Research work with methyl bromide is now being carried on in various parts of the United States. These experiments cover not only general fumigation which is an accepted practice in many locations, but cover special greenhouse work, experiments on disposing of rattlesnakes, and even deep-digging ants. As the results of experiments become available, they will be presented in the Agricultural News Letter. The work carried on so far indicates that qualified recommendations can be made for the use of methyl bromide in controlling insect and animal pests.

In 1932, several French researchers working with methyl bromide, the colorless almost odorless gas derived by the action of bromine on methyl alcohol, brought to light certain of its outstanding insecticidal properties. This important discovery which foretold, even then, its advantages as a fumigant, thus supplied the urge for broader and more practical investigations in the years to follow. The first work in the United States was accomplished by D. B. Mackie of the California State Department of Agriculture.

Since then workers in agricultural experiment stations and universities in this country and Canada have carried on experiments with methyl bromide, aiming principally at developing its useful and practical applications as a fumigant.

They have discovered that methyl bromide has the following advantages as a fumigant:

1. It is highly toxic to a wide variety of insect and animal pests.

2. It has high penetrating power, and, being heavier than air, penetrates downward.

3. It is much less harmful to plant life and tender plant products than many other fumigants.

4. It has high chemical stability and a low degree of solubility in water. It is not absorbed by, nor does it injure, many foodstuffs, fabrics or materials of construction.

5. It is non-flammable and non-explosive as used in fumigation.

6. It is quickly and easily applied by the proper methods.

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Du Pont methyl bromide has the following specifications:

| | |
|---|---|
| Formula ...................... | $CH_3Br$ |
| Boiling Point ................ | 40.1°F. |
| Freezing Point ............... | -135.4°F. |
| Specific gravity of liquid ... | 1.732 at 32°F. |
| Weight per gallon ............ | 14.4 lbs. at 32°F. |
| Solubility: | |
| In water ................... | Very slight. |
| In oils and most organic solvents ......... | High. |

At ordinary temperatures and pressures methyl bromide is a colorless, almost odorless gas about 3½ times heavier than air. Being toxic to all forms of animal life, it must be handled as a dangerous fumigant.

The following preliminary recommendations for fumigators using methyl bromide or mixtures containing methyl bromide as a fumigant were issued by the United States Public Health Service:

1. Avoid breathing air containing methyl bromide.

2. On completion of fumigation, provide thorough ventilation for cars, rooms or buildings, before entering.

3. When necessary to enter spaces containing methyl bromide, use a gas mask provided with a canister giving protection against organic vapors, or a positive pressure hose mask. (Masks and canisters to be approved under United States Bureau of Mines Schedules 14D or 19A. Canisters, black, Type B.)

4. Avoid spilling of methyl bromide. Get to fresh air immediately in case of spillage. Remove any clothing (in contact with skin) which has become impregnated with the liquid.

5. Post warning signs notifying that methyl bromide is being used and that the gas is toxic.

6. Containers of methyl bromide should be stored in a cool, well-ventilated place, outside inhabited buildings. Avoid leakage by seeing that valves on cylinders are tightly closed.

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## "DELSTEROL" - AN ESSENTIAL NUTRITIONAL ELEMENT FOR POULTRY.

EDITOR'S NOTE: The Biological Laboratory Staff of the Organic Chemicals Department has recently published an illustrated booklet describing Du Pont's new Vitamin D for poultry, "Delsterol" D-Activated Animal Sterol. Requests for the booklet should be directed to-

Organic Chemicals Department,
E. I. du Pont de Nemours & Co.,
Wilmington, Delaware.

Extracts from this bulletin follow:-

"DELSTEROL" D-Activated Animal Sterol is a new source of Vitamin D, the result of more than ten years of experimental research.

Evolved from a new scientific principle, "Delsterol" is produced entirely from domestic raw materials.

The development of "Delsterol" may be traced through four broad stages of research. The first was the discovery that exposure to direct sunlight (ultra-violet rays) produced Vitamin D in the body of young and mature poultry. The second was the observation that this effect could be obtained by exposing to ultra-violet light the feed which the animals consume. The third step was the discovery that certain specific chemical compounds, known as sterols or pro-vitamins,* were transformed into Vitamin D when irradiated with ultra-violet light. The fourth and last stage was the discovery ** of the conspicuous difference in Vitamin D effectiveness for poultry between irradiated pro-vitamins from animal and plant sources.

It was in 1930 that Du Pont biological chemists undertook the investigation of activating suitable sterols with ultra-violet light to produce an effective Vitamin D for poultry feeds. It had previously been assumed there was no essential difference in the active Vitamin D effect produced by the irradiation of plant and animal sterols. The scientists engaged upon this problem, however, found that the sterols of animal origin were many times more effective in producing a Vitamin D for poultry than were the sterols from plant sources. This fundamental discovery in the Du Pont laboratories pointed the way to the succession of experiments which resulted in the creation of "Delsterol."

*That part of the sterol which is activatable is designated as the pro-vitamin.

**The Anti-rachitic Efficacy of Irradiated Cholesterol, J. Waddell- The Journal of Biological Chemistry, vol. 105, p. 711, July 1934.

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The formula for producing a new source of Vitamin D had been evolved, but two vital problems required further experimental research. It was necessary to determine which of the available animal sterols were the most suitable for irradiation, and it was equally necessary to locate these sterols in sufficient quantities to permit economic production. For this scientific achievement could be translated into a practical and useful result for the poultry industry only if an uninterrupted and continuous supply of "Delsterol" could be assured.

In the time-consuming search for pro-vitamins answering these requirements, it was eventually found that the sterols extracted from certain marine animals contained a suitable pro-vitamin in high concentration. And, additionally, a method was developed by which the sterol from certain by-products of the meat packing industry could be converted into a satisfactory pro-vitamin.

Scientific methods were then developed for irradiating these substances with ultra-violet light. In this manufacturing step the sterols are exposed to the light under carefully controlled conditions. The active material is then dispersed in an edible powder carrier.

The choice of a powder carrier for "Delsterol" was made after it had been established that Vitamin D is most easily incorporated into commercial feeds when introduced in this form. Efficient dispersement, and ease and convenience in mixing are additional factors of advantage provided by the powder carrier.

The quantity of Vitamin D in a given batch of "Delsterol" is established by actually feeding some of the vitamin to young growing chicks. The test is prescribed by the Association of Official Agricultural Chemists for testing Vitamin D materials.

After any Vitamin D material has been subjected to this test, the number of Vitamin D units per given quantity is designated by stating them in the initials of this Association-A.O.A.C. By definition, one A.O.A.C. unit of Vitamin D is equal in biological activity for the chick to one unit of Vitamin D in the United States Pharmacopoeia Reference Cod Liver Oil by the A.O.A.C. method of assay. This is clearly a statement of Vitamin D activity specifically for poultry. The potency of "Delsterol" is stated in terms of A.O.A.C. chick units.

In using "Delsterol," it is usual to mix one or more pounds per ton, depending upon the potency desired in the mixed feed. "Delsterol" is offered for sale at two levels of Vitamin D activity; namely, 450,000 A.O.A.C. chick units per pound and 900,000 A.O.A.C. chick units per pound. Stated in other terms, this corresponds to 1,000 and 2,000 A.O.A.C. units of Vitamin D per gram.